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09/666,382	09/20/2000	Xiao-Dong Sun	RD-27,624	6126

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EXAMINER	
SODERQUIST, ARLEN	
ART UNIT	PAPER NUMBER
1743	9

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Please find below and/or attached an Office communication concerning this application or proceeding.

mk-9

Office Action Summary	Application No. 09/666,382	Applicant(s) Sun
	Examiner Arlen Soderquist	Art Unit 1743

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *Feb 20, 2003* .

2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1, 2, 4-6, 8-20, 23-30, and 32-34* is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1, 2, 4-6, 8-20, 23-30, and 32-34* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____
4) ☐ Interview Summary (PTO-413) Paper No(s). _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

1. Claims 1-2, 4-6, 8-20, 23-30 and 32-34 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Each of the independent claims was amended to add the language "within a linear dynamic range from (of) greater than 5 nano-liter to about 250 micro-liter". Examiner was not able to find basis in the specification for "greater than 5 nano-liter" since the specification and claims all teach "from about 4 nanoliter".

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1-2, 4-6, 8-20, 23-30 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xiang (US 6,048,469) in view of Schultz (US 5,985,356) and Salomaa. In the patent Xiang teaches advanced phosphors discovered through combinatorially synthesizing candidates and then testing them for luminescence. Figure 2 shows a system for the synthesis of the candidate materials which is substantially similar to the instantly claimed device. The system has up to 8 inkjet heads connected with various chemical reservoirs used in making the various candidate compositions. Column 5, line 60 to column 6 line 12 describes the system including the substrate having wells and the motorized x-y stage that the support is attached to for the deposition part of the synthesis. In particular column 5, line 67 to column 6 line 5 teaches

making "virtually any stoichiometry and composition of solution phase precursors" or creating mixtures of solution phase precursors. Column 6, lines 13-22 teach using the system to produce libraries that are processed in different atmospheres at different temperatures to obtain different photoluminescent images by color photography under broad UV irradiation. Lines 14-19 teach a number of aqueous solutions that were used as precursors to form the mixtures or compositions of the library. Example 1 clearly teaches mixing of the solution precursors (column 6, lines 29-34). When one looks at column 5, lines 5-15, the full understanding of this heat treatment and the inherent need for a furnace to provide the heat treatment becomes totally clear. The patent differs from the instant claims in that the inkjet is not a positive displacement dispenser.

In the patent Schultz teaches the combinatorial synthesis of novel materials. Table 1 teaches that emission is one of the possible properties that can be examined for the materials that are synthesized. Column 20, line 18 to column 24, line 53 discuss the formation of these materials through delivery of them to a substrate by a dispenser. Column 20 lines 19-29 teach that dispensers can be utilized to generate diverse combinations of reactant components in the form of droplets or powder on a single substrate. Particularly relevant is that commercially available micropipetting apparatus can be adapted to dispense droplet volumes of 5 nanoliters or smaller from a capillary. Such droplets can fit within a reaction region having a diameter of 300 μm or less when a non-wetting mask is employed. In some embodiments, the micropipette is accurately and precisely positioned above the reaction, as described in the specification, before the reactant solution is deposited. Also taught is the use of multiple dispensers. In column 22, lines 17-37 the manner in which the dispenser(s) can dispense the components is explained using an inkjet dispenser as an example of a preferred dispenser.

In the patent Salomaa teaches a liquid handling system for performing automatic transfer of liquid samples between a plurality of receptacles. More specifically, it is directed to a system for filling, or transferring liquid samples between, a multiplicity of separate liquid receptacles, such as is required in initial filling and serial dilution of liquid samples in microtiter trays where each receptacle holds only about one tenth to ten milliliters of liquid. Such a serial dilution system basically involves mixing the sample with successively increasing proportions of a

diluent in separate receptacles thereby to obtain a series of successively decreasing concentrations of the sample. The various sample concentrations can then be assayed to determine a particular property. The figures show the microtiter plate on a table (10) that is movable to place the microtiter plate under the positive displacement dispensers (36) which as shown in figure 3 have a plunger rod (40) for each dispenser. Column 1, lines 25-28 teaches blood serum as an example of a sample liquid in the device of Salomaa. Column 6, lines 9-15 an alternative embodiment in which a supply of a liquid biological material or a reagent may be used in the device. Thus whether it be a mixture between a sample and a diluent or a reagent the Salomaa reference teaches making mixtures.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a commercially available dispenser(s) such as that of Salomaa into the Xiang device because of their known use in creating gradients of compositions as taught by Salomaa and because of the recognition by Schultz that commercially available dispensers are capable of dispensing components for creating materials that are subsequently evaluated for properties such as luminescence (emission).

4. Claims 1-2, 4-6, 8-20, 23-30 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xiang (US 6,048,469) in view of Schultz (US 5,985,356), Jorgensen and Stahli. In the patent Xiang teaches advanced phosphors discovered through combinatorially synthesizing candidates and then testing them for luminescence. Figure 2 shows a system for the synthesis of the candidate materials which is substantially similar to the instantly claimed device. The system has up to 8 inkjet heads connected with various chemical reservoirs used in making the various candidate compositions. Column 5, line 60 to column 6 line 12 describes the system including the substrate having wells and the motorized x-y stage that the support is attached to for the deposition part of the synthesis. In particular column 5, line 67 to column 6 line 5 teaches making "virtually any stoichiometry and composition of solution phase precursors" or creating mixtures of solution phase precursors. Column 6, lines 13-22 teach using the system to produce libraries that are processed in different atmospheres at different temperatures to obtain different photoluminescent images by color photography under broad UV irradiation. Lines 14-19 teach a

number of aqueous solutions that were used as precursors to form the mixtures or compositions of the library. Example 1 clearly teaches mixing of the solution precursors (column 6, lines 29-34). When one looks at column 5, lines 5-15, the full understanding of this heat treatment and the inherent need for a furnace to provide the heat treatment becomes totally clear. The patent differs from the instant claims in that the inkjet is not a positive displacement dispenser.

In the patent Schultz teaches the combinatorial synthesis of novel materials. Table 1 teaches that emission is one of the possible properties that can be examined for the materials that are synthesized. Column 20, line 18 to column 24, line 53 discuss the formation of these materials through delivery of them to a substrate by a dispenser. Column 20 lines 19-29 teach that dispensers can be utilized to generate diverse combinations of reactant components in the form of droplets or powder on a single substrate. Particularly relevant is that commercially available micropipetting apparatus can be adapted to dispense droplet volumes of 5 nanoliters or smaller from a capillary. Such droplets can fit within a reaction region having a diameter of 300 μm or less when a non-wetting mask is employed. In some embodiments, the micropipette is accurately and precisely positioned above the reaction, as described in the specification, before the reactant solution is deposited. Also taught is the use of multiple dispensers. In column 22, lines 17-37 the manner in which the dispenser(s) can dispense the components is explained using an inkjet dispenser as an example of a preferred dispenser.

In the paper Jorgensen discusses fully automated membrane dispensing in nanoliter scale and its application in sensor manufacturing. The rising degree of miniaturization in sensor technology and the efforts to make industrial use of it require an adequate solution for coating of sensors with membranes needed for various applications. A fully automated dispensing device was developed which is capable of dispensing droplets in nanoliter range with high accuracy and reproducibility. The device combines a three axles positioning system with a pattern recognition system and a dispensing valve and is suited for industrial mass production of sensors (page 207). Up to 150 droplets per minute are possible. Positioning accuracy is below three micrometer and standard deviation of the dispensing process is 2% or lower. The reproducibility of the process is independent from properties of the medium to be dispensed such as viscosity or solvent and

shows no dependence on dispensing parameters such as needle diameter or dispensing time. The measurement of dissolved oxygen in a liquid solution serves as application example to show the practical suitability of the dispensing device.

In the patent Stahli presents an automatic pipetter utilizing a syringe having several openings at its end. A different tubing segment connects with each of these openings and extends into different vials of liquids. Of these vials, one contains a buffer solution generally used in appreciably greater quantities than the others. Another vial receives the liquids from the syringe. As a stepping motor partially withdraws the piston from the syringe, a tube leading to a vial with unmeasured liquid is open. When the stepping motor reinserts the plunger into to the syringe, the tube leading to the receiving vial becomes open while the other tubes remain closed. The tubing segments extending between the syringe and the vials include three sections. The section closest to the syringe, formed from polyimide, undergoes a minimal change in its volume notwithstanding the negative and positive partial pressures exerted by the piston. The second section, having a plasticized polyvinyl chloride construction, has greater flexibility than the polyimide portion. Pinching off this flexible section from the outside provides a valving device for the system. The last section of the tubing consists of stainless steel and runs into the vial to provide a high degree of rigidity. Coating the inside with dimethyldichlorosilane reduces its rusting and cross-contamination between pipetted liquid. In operating the pipetter, the buffer should follow the other liquids placed into a single container. This washes the syringe between samples and avoids carry-over error from one sample to the next. After expelling fluid from the syringe, the stepping motor moves at least one step in the direction of withdrawing the piston but with the outlet open. This removes the slack in the coupling between the motor and the piston and increases the accuracy in the volume of sample drawn into the syringe. The pipetter, when called upon to deliver a microliter of a particular liquid, will deliver from 0.98 to 1.02 microliters at least 90 per cent of the time. Column 10 discusses how the stepper motor is operated and teaches that for 20 steps of rotation, the apparatus moves 1 microliter of fluid (the device is capable of moving less that one microliter of fluid). Column 13, lines 1-34 teach the use of computer control of the motor speed relative to sample size or viscosity. The section also teaches

the versatility of the device in being automatically controllable to dispense one liquid; formulate a solution of several liquids; prepare several solutions; or take a liquid from one of the vials and place it in several others.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a commercially available dispenser(s) such as that of Stahli into the Xiang device because of their known use in formulating mixtures, preparing multiple solutions and handling viscose materials as taught by Stahli and Jorgensen and because of the recognition by Schultz that commercially available dispensers are capable of dispensing components for creating materials that are subsequently evaluated for properties such as luminescence (emission).

5. Applicant's arguments filed February 20, 2003 have been fully considered but they are not persuasive. Relative to the rejection of the claims based on the combination including the Salomaa reference examiner has shown in the explanations above of the Xiang and Salomaa references where the formation of mixtures is taught. For a clear understanding of the examiner's position, a mixture includes dilutions because it is a mixture of two different liquids. In fact the Xiang reference is creating a series of dilutions as the volumes of the different liquids are varied to form the different compositions. Relative to the combinations of references applicant appears to be completely ignoring the teachings of the Schultz reference which clearly teaches combinatorial synthesis using several types of liquid dispensers in volumes as low as 5 nanoliters. If one ignores the teachings of Schultz as applicant has apparently done the arguments are valid relative to the combination of references. However, the Schultz reference clearly gives teachings that are relevant to the skill of one in the art and the level of the prior art. It clearly shows that one of skill in the art would have been aware of the various types of liquid dispensers and would have recognized that dispensers other than the ink-jet type were possible to make the various compositions. Additionally it shows that volumes as small as applicant has claimed are possible with the various liquid dispensers. As previously pointed out in paper number 7, Schultz does clearly teach the use of positive displacement dispensers in the preparation of combinatorial composition for the broad range of materials covered by the

reference. Since the Schultz reference clearly teaches a variety of dispensers are possible, known properties of a pipette type of dispenser such as accurate positioning or known abilities to handle viscose liquids with accuracy and precision would not have come from the teachings of applicant. In particular applicant is referred to the newly cited and applied Jorgensen and Stahli references. Relative to the claimed volumes, Xiang teaches volumes using the inkjet (column 5) of at least between 50 nanoliters to 5 microliters. The range could clearly cover the claimed range since a single drop is smaller than a nanoliter and there appears to be no requirement for the system to stop at 10,000 drops. From the Jorgensen reference it is clear that delivery of volumes through a pipette (needle) in the nanoliter range is clearly possible. From the Stahli reference it is clear that delivery of fluid at least covering the specific range taught by Xiang is possible with a micropipettor. These two references also clearly deal with any issues of viscosity. Relative to the linear dynamic range found in the claims, it should be pointed out that examiner was unable to find a definition of the phrase in the specification and applicant has not provided evidence that the phrase is a term of art known to one of ordinary skill. If applicant arguing that the capabiility to transfer any volume between the claimed limits (e.g. 7.123456789 nanoliters) is the proper dsfinition of the phrase, examiner would like to see proof of the capability. If the actual device capability is steps of a defined volume (e.g. 1 nanoliter) then the references showing multiple drops being used to dispense volumes of differing size is equivalent to the claimed linear dynamic range. Relative to a particle suspension see at least Schultz column 26, lines 28-33. Relative to the question of viscosity applicant is referred to the cited sections of the following references. Emphasis has been added.

Column 2, lines 36-42 of US Patent 4,279,775 to Louderback et al. states.

> "Viscosity is usually expressed in dyne-seconds per square centimeter or poises. One poise equals 100 centipoises. The **absolute viscosity of water** at 20° C. for calibration purposes is 0.01002 poises as reported by Swindells et al, *Journal of Research, National Bureau of Standards*, 48, 1 (1952). **Blood has a viscosity about 5 to 6 times greater than water, or about 5 to 6 centipoises.** "

From this it is clear that water at 20° C has a viscosity that is greater than 1 centipoise. Thus the claimed minimum is probably met by most aqueous salt solutions

Column 2, lines 6-13 of US Patent 5,336,468 to Tezuka et al. states.

> "However, **blood plasma and blood serum**, which are processed during clinical assays, **have a high viscosity falling within the range of 1.5 to 2.5 cP**. Therefore, the liquid shifting phenomenon easily occurs with such liquid samples. Also, **whole blood samples have a viscosity as high as 10 cP to several tens of centipoises**, and the liquid shifting phenomenon very easily occurs with such liquid samples."

Both of these references are relevant to the Salomaa reference and show that the serum used as an example in the Salomaa reference fits within the claimed viscosity ranges. Furthermore the Salomaa reference teaches liquid biological materials of which whole blood would clearly fit. Whole blood is clearly a suspension having particles (blood cells) therein and the Salomaa reference clearly shows that viscose solutions or particle containing suspensions are capable of being dispensed by positive displacement dispensers.

6. Of apparent relevance to the instant claims is an apparent admission, by the instant inventor, in the Sun MRS Bulletin article in the paragraph bridging pages 310-311 that a commercial automated liquid dispenser was used. The instant inventor is an author of the article. This paragraph references a figure 2a which appears to be equivalent to instant figure 1. Applicant's assistance in determining how the instantly claimed dispensing system (claims 27+) differs from the commercial automated liquid dispenser disclosed by the Sun reference is requested. Alternatively applicant is requested to provide technical information about the commercial automated liquid dispenser of the article.

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however,

will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additional references are directed to liquid dispensers usable to transfer fluids or the physical properties of blood.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arlen Soderquist whose telephone number is (703) 308-3989. The examiner's schedule is variable between the hours of about 5:30 AM to about 5:00 PM on Monday through Thursday and alternate Fridays.

For communication by fax to the organization where this application or proceeding is assigned, (703) 305-7719 may be used for official, unofficial or draft papers. When using this number a call to alert the examiner would be appreciated. Numbers for faxing official papers are 703-872-9310 (before finals), 703-872-9311 (after-final), 703-305-7718, 703-305-5408 and 703-305-5433. The above fax numbers will generally allow the papers to be forwarded to the examiner in a timely manner.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Arlen Soderquist

April 24, 2003

ARLEN SODERQUIST
PRIMARY EXAMINER